SEQUENCE LISTING

Hanley-Bowdoin, Linda Orozco, Beverly M. Gruissem, Wilhelm

- <120> GEMINIVIRUS RESISTANT TRANSGENIC PLANTS
- <130> 5051.458IP
- <140> US 10/633,850
- <141> 2003-08-04
- <150> US 09/289,346
- <151> 1999-04-09
- <150> US 60/125,004
- <151> 1999-03-18
- <160> 113
- <170> PatentIn version 3.3
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- <213> Tomato golden mosaic virus
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- Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45
- Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60
- Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80
- Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95
- Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val	Trp	Gly 115	Glu	Phe	Gln	Val	120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys

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Tyr Leu Phe Ala Phe Ala Ala Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

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Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys
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Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys 35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

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Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys 35 40 45

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Ser Ala Ala Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys

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Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

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Ser Lys Ala Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys 35 40 45

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Ser Lys Ala Ala Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys
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25

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Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

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Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

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tttcagttcc	acaatctaaa	tagcaattta	gataggatat	ttgataagac	tcctgaacca	540
tggcttcctc	cgttccacgt	ctcatcattt	actaacgtgc	cagacgagat	gagacaatgg	600
gctgaaaatt	attttggaaa	gagttccgct	gcgcggccgg	agagacctat	tagtattatc	660
atcgagggcg	atagtcggac	gggaaagact	atgtgggctc	gttcactagg	cccacataat	720
tatttgagcg	ggcatttgga	tctcaattct	agggtttact	caaacaaggt	tgagtataac	780
gtcatcgatg	atgtcacacc	gcaatatcta	aagttgaaac	attggaaaga	actcattggg	840
gcccaaagag	attggcagac	taactgtaaa	tacggaaagc	cagttcaaat	taaaggaggt	900
atcccgtcaa	tcgtgctgtg	caatcctgga	gagggtgcta	gctataaagt	tttcctcgac	960
aaagaggaaa	acactccact	aaagaactgg	actttccata	atgcgaaatt	cgtcttcctc	1020
aactccccc	tctatcaaag	ctcaacacag	agcagc			1056

- <210> 51 <211> 1056
- <212> DNA
- <213> Tomato golden mosaic virus

<220>

<221> CDS (1)..(1056) <223> TGMV AL1 FQ118 mutant (Ala13) <400> 51 atg cca tcg cat cca aaa cgg ttt caa ata aat gcc aaa aat tat ttt 48 Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe ctt aca tat cct cag tgc tcc ttg tcc aaa gaa gaa tca ctt tct caa 96 Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 tta caa gcc cta aac act ccg att aac aaa aaa ttc ata aaa atc tgc 144 Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys aga gag ctt cat gaa gat ggg caa cct cac ctc cac gtg ctt att cag 192 Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln ttc gag gga aaa tac tgc tgc caa aat caa cga ttc ttc gac ctg gta 240 Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 75 tcc cca aca agg tca gca cat ttc cat cca aac att cag aga gct aaa 288 Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 teg tet tee gae gte aag aeg tae ate gae aaa gae gga gat aet ett 336 Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 gta tgg gga gaa gcc gcg gtc gac ggt cga agt gct aga gga ggt tgc 384 Val Trp Gly Glu Ala Ala Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 caa aca tct aac gac gct gca gca gag gcg tta aat gct tct tcc aaa 432 Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 135 gaa gaa gcc ctg cag ata att aga gag aaa atc cca gaa aaa tat tta 480 Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu ttt cag ttc cac aat cta aat agc aat tta gat agg ata ttt gat aag 528 Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175 act cet gaa cea tgg ett eet eeg tte cae gte tea tea ttt act aac 576 Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 190 gtg cca gac gag atg aga caa tgg gct gaa aat tat ttt qqa aaq aqt 624 Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200

										att Ile						. 672
										tca Ser 235						720
										agg Arg						768
										ccg Pro						816
										aga Arg						864
tgt Cys	aaa Lys 290	tac Tyr	gga Gly	aag Lys	cca Pro	gtt Val 295	caa Gln	att Ile	aaa Lys	gga Gly	ggt Gly 300	atc Ile	ccg Pro	tca Ser	atc Ile	912
										tat Tyr 315						960
										act Thr						1008
										agc Ser						1056

<210> 52

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 52

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80 Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

60

55

50

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Ala Ala Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235

Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285

Cys Lys Tyr Gly 290	' Lys Pro Val 295	-	Gly Gly Ile Pro 300	Ser Ile
Val Leu Cys Asr 305	n Pro Gly Glu 310	Gly Ala Ser	Tyr Lys Val Phe 315	Leu Asp 320
Lys Glu Glu Asr	Thr Pro Leu 325	Lys Asn Trp 330	Thr Phe His Asn	Ala Lys 335
Phe Val Phe Leu 340		Leu Tyr Gln 345	Ser Ser Thr Gln 350	
<210> 53 <211> 1056 <212> DNA <213> Tomato g	golden mosaic	virus		
<220> <221> CDS <222> (1)(10 <223> TGMV ALI	056) . D120 (Ala14) mutant		
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			gaa gaa tca ctt Glu Glu Ser Leu 30	
			aaa ttc ata aaa Lys Phe Ile Lys 45	
			ctc cac gtg ctt Leu His Val Leu 60	
			cga ttc ttc gac Arg Phe Phe Asp 75	
			aac att cag aga Asn Ile Gln Arg	
	Val Lys Thr		aaa gac gga gat Lys Asp Gly Asp 110	Thr Leu

			gcg Ala											384
			gct Ala											432
		-	ata Ile 150							-				480
_			cta Leu		_			-				_	_	528
			ctt Leu											576
	_	 _	aga Arg			_	_					_	_	624
		 	gag Glu	_			_						_	672
			act Thr 230											720
			ttg Leu											768
			atc Ile											816
			ctc Leu			_		_	-		_			864
			cca Pro											912
			gga Gly 310											960
			cca Pro		_									1008

ttc gtc ttc ctc aac tcc ccc ctc tat caa agc tca aca cag agc agc Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350
<210> 54 <211> 352 <212> PRT <213> Tomato golden mosaic virus
<400> 54
Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15
Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30
Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45
Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60
Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80
Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95
Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110
Val Trp Gly Glu Ala Ala Val Ala Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125
Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140
Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160
Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn

180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240

Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335

Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350

<210> 55

<211> 1056

<212> DNA

<213> Tomato golden mosaic virus

<220>

<221> CDS

<222> (1)..(1056)

<223> TGMV AL1 RS-R125 (Ala1) mutant

<400> 55

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		cc aaa gaa gaa tca ctt er Lys Glu Glu Ser Leu 5 30	
		ac aaa aaa ttc ata aaa sn Lys Lys Phe Ile Lys 45	_
		ct cac ctc cac gtg ctt ro His Leu His Val Leu 60	•
		at caa cga ttc ttc gac sn Gln Arg Phe Phe Asp 75	
		at cca aac att cag aga is Pro Asn Ile Gln Arg 90	_
	Val Lys Thr Tyr I	tc gac aaa gac gga gat le Asp Lys Asp Gly Asp 05 110	
		gt gcg gcc gct gca gga ly Ala Ala Ala Ala Gly 125	
		ag gcg tta aat gct tct lu Ala Leu Asn Ala Ser 140	
		ag aaa atc cca gaa aaa lu Lys Ile Pro Glu Lys 155	
		at tta gat agg ata ttt sn Leu Asp Arg Ile Phe 170	
	Trp Leu Pro Pro P	tc cac gtc tca tca ttt he His Val Ser Ser Phe 85 190	
		ct gaa aat tat ttt gga la Glu Asn Tyr Phe Gly 205	
		tt agt att atc atc gag le Ser Ile Ile Ile Glu 220	
		ct cgt tca cta ggc cca la Arg Ser Leu Gly Pro 235	

tat ttg agc ggg cat ttg gat ctc aat tct agg gtt tac tca aac aag Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255	768
gtt gag tat aac gtc atc gat gat gtc aca ccg caa tat cta aag ttg Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270	816
aaa cat tgg aaa gaa ctc att ggg gcc caa aga gat tgg cag act aac Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285	864
tgt aaa tac gga aag cca gtt caa att aaa gga ggt atc ccg tca atc Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300	912
gtg ctg tgc aat cct gga gag ggt gct agc tat aaa gtt ttc ctc gac Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320	960
aaa gag gaa aac act cca cta aag aac tgg act ttc cat aat gcg aaa Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335	1008
ttc gtc ttc ctc aac tcc ccc ctc tat caa agc tca aca cag agc agc Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350	1056
<210> 56 <211> 352 <212> PRT <213> Tomato golden mosaic virus	
<400> 56	
Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15	
Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30	
Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45	
Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60	

ser	PIO	1111	Arg	85	AIA	uis	PHE	нта	90	ASII	iie	GIII	Arg	95	гуѕ
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Ala	Ala	Ala	Ala 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val	Leu	Cys	Asn	Pro	Gly	Glu	Glv	Ala	Ser	Tvr	Lvs	Val	Phe	Leu	Asp

305	310	315	320

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 345 350 <210> 57 <211> 1056 <212> DNA <213> Tomato golden mosaic virus <220> <221> CDS <222> (1)..(1056) TGMV AL1 QT130 (Ala2) mutant <400> 57 atg cca tcg cat cca aaa cgg ttt caa ata aat gcc aaa aat tat ttt 48 Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe ctt aca tat cct cag tgc tcc ttg tcc aaa gaa gaa tca ctt tct caa 96 Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln tta caa gcc cta aac act ccg att aac aaa aaa ttc ata aaa atc tgc 144 Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys aga gag ctt cat gaa gat ggg caa cct cac ctc cac gtg ctt att cag 192 Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 55 ttc gag gga aaa tac tgc tgc caa aat caa cga ttc ttc gac ctg gta 240 Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val tcc cca aca agg tca gca cat ttc cat cca aac att cag aga gct aaa 288 Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys teg tet tee gae gte aag aeg tae ate gae aaa gae gga gat aet ett 336 Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110 gta tgg gga gaa ttc cag gtc gac ggt cga agt gct aga gga ggt tgc 384 Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 gca gct agc aac gac gct gca gca gag gcg tta aat gct tct tcc aaa 432

Ala Ala Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys

	130					135					140					
					ata Ile 150											480
					cta Leu											528
					ctt Leu											576
					aga Arg											624
					gag Glu											672
					act Thr 230											720
Tyr	Leu	Ser	Gly	His 245	ttg Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys	768
					atc Ile											816
Lys	His	Trp 275	Lys	Glu	ctc Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	864
Cys	Lys 290	Tyr	Gly	Lys	cca Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	912
Val 305	Leu	Cys	Asn	Pro	gga Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	960
					cca Pro											1008
					tcc Ser											1056

<210> 58 <211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 58

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln
20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu
100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Ala Ala Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys
165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

	ser	210	Ala	Arg	Pro	GIU	215	Pro	11e	ser	iie	220	iie	GIU	GIÀ	Asp		
	Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240		
	Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys		
	Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu		
	Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn		
	Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile		
	Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320		
	Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys		
	Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser		
<210> 59 <211> 1056 <212> DNA <213> Tomato golden mosaic virus																		
	<220> <221> CDS <222> (1)(1056) <223> TGMV AL1 ND133 (Ala3) mutant																	
		cca	59 tcg Ser														4	48
			tat Tyr														5	96
	tta	caa	gcc	cta	aac	act	ccg	att	aac	aaa	aaa	ttc	ata	aaa	atc	tgc	14	44

Leu	Gln	Ala 35	Leu	Asn	Thr	Pro	Ile 40	Asn	Lys	Lys	Phe	Ile 45	Lys	Ile	Cys	
						999 Gly 55										192
					_	tgc Cys				_			_	_	_	240
						cat His						_	_	-		288
						acg Thr										336
-			_		_	gtc Val	_		_	_	_	_			_	384
						gca Ala 135										432
						att Ile										480
						aat Asn										528
		_				cct Pro	_			_						576
						caa Gln										624
						aga Arg 215										672
						atg Met										720
						gat Asp										768
						gat Asp										816

			260					265					270	
aaa	cat	tgg	aaa	gaa	ctc	att	ggg	gcc	caa	aga	gat	tgg	cag	á

act aac 864 Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 tgt aaa tac gga aag cca gtt caa att aaa gga ggt atc ccg tca atc 912 Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 295 gtg ctg tgc aat cct gga gag ggt gct agc tat aaa gtt ttc ctc gac 960 Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 310 315 320 aaa gag gaa aac act cca cta aag aac tgg act ttc cat aat gcg aaa 1008 Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 tte gte tte etc aac tee eec etc tat caa age tea aca eag age age 1056 Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345

<210> 60

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 60

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 . 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Ala	Ala	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320
Lys	Glu	Glu	Asn	Thr	Pro	Leu	Lys	Asn	Trp	Thr	Phe	His	Asn	Ala	_

Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350

<210><211><211><212><213>	61 1056 DNA Toma	to go	oldei	n mos	saic	vir	ıs								
<220> <221> <222> <223>	CDS (1). TGMV			N140	(Ala	a4) r	mutai	nt							
<400>	61														
atg cc. Met Pro 1															48
ctt ac Leu Th															96
tta ca Leu Gl															144
aga ga Arg Gl															192
ttc ga Phe Gl															240
tcc cc Ser Pr															288
tcg tc Ser Se															336
gta tg		Glu													384
caa ac Gln Th 13	r Ser														432
gaa ga Glu Gl 145															480
ttt ca	g ttc	cac	aat	cta	aat	agc	aat	tta	gat	agg	ata	ttt	gat	aag	528

Phe Gln Phe His	Asn Leu Asn 165	Ser Asn Leu 170	Asp Arg Ile Phe	Asp Lys 175
	Trp Leu Pro		gtc tca tca ttt Val Ser Ser Phe 190	
			aat tat ttt gga Asn Tyr Phe Gly 205	
		Pro Ile Ser	att atc atc gag Ile Ile Ile Glu 220	
		Trp Ala Arg	tca cta ggc cca Ser Leu Gly Pro 235	
			agg gtt tac tca Arg Val Tyr Ser	
	Val Ile Asp		ccg caa tat cta Pro Gln Tyr Leu 270	
			aga gat tgg cag Arg Asp Trp Gln 285	
		Gln Ile Lys	gga ggt atc ccg Gly Gly Ile Pro 300	
			tat aaa gtt ttc Tyr Lys Val Phe 315	
			act ttc cat aat Thr Phe His Asn	
	Asn Ser Pro		agc tca aca cag Ser Ser Thr Gln 350	
<210> 62 <211> 352 <212> PRT <213> Tomato g	olden mosaic	: virus		
<400> 62				
Met Pro Ser His 1	Pro Lys Arg	Phe Gln Ile	Asn Ala Lys Asn	Tyr Phe 15

Бец	1111	ıyı	20	GIII	Cys	ser	ьеи	25	гуѕ	GIU	GIU	ser	30	ser	GIN
Leu	Gln	Ala 35	Leu	Asn	Thr	Pro	Ile 40	Asn	Lys	Lys	Phe	Ile 45	Lys	Ile	Cys
Arg	Glu 50	Leu	His	Glu	Asp	Gly 55	Gln	Pro	His	Leu	His 60	Val	Leu	Ile	Gln
Phe 65	Glu	Gly	Lys	Tyr	Cys 70	Cys	Gln	Asn	Gln	Arg 75	Phe	Phe	Asp	Leu	Val 80
Ser	Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Ala	Ala	Leu	Ala 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240

Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys	
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu	
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	
Val 305	Leu	Суз	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys	
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser	
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					aaa Lys											48
					tgc Cys											96
					act Thr											144
					gat Asp											192

					tgc Cys 70					_			_	_	_	240
					gca Ala											288
					aag Lys											336
gta Val	tgg Trp	gga Gly 115	gaa Glu	ttc Phe	cag Gln	gtc Val	gac Asp 120	ggt Gly	cga Arg	agt Ser	gct Ala	aga Arg 125	gga Gly	ggt Gly	tgc Cys	384
					gct Ala											432
					ata Ile 150											480
					cta Leu											528
					ctt Leu											576
					aga Arg											624
					gag Glu											672
		-		_	act Thr 230	-		_	_							720
					ttg Leu											768
					atc Ile											816
					ctc Leu											864
tgt	aaa	tac	gga	aag	cca	gtt	caa	att	aaa	gga	ggt	atc	ccg	tca	atc	912

Cys Lys 290		Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	
gtg ctg Val Leu 305															960
aaa gag Lys Glu															1008
ttc gtc Phe Val															1056
<210><211><211><212><213>	64 352 PRT Toma	to a	പി ർല	a mos	zaic	vir	16								
<400>	64	co g	Jiuci	.1 11101	Jaic	V 1 1 1	40								
Met Pro	Ser	His	Pro 5	Lys	Arg	Phe	Gln	Ile 10	Asn	Ala	Lys	Asn	Tyr 15	Phe	
Leu Thi	Tyr	Pro 20	Gln	Cys	Ser	Leu	Ser 25	Lys	Glu	Glu	Ser	Leu 30	Ser	Gln	
Leu Glr	a Ala 35	Leu	Asn	Thr	Pro	Ile 40	Asn	Lys	Lys	Phe	Ile 45	Lys	Ile	Cys	
Arg Glu 50	ı Leu	His	Glu	Asp	Gly 55	Gln	Pro	His	Leu	His 60	Val	Leu	Ile	Gln	
Phe Glu 65	ı Gly	Lys	Tyr	Cys 70	Cys	Gln	Asn	Gln	Arg 75	Phe	Phe	Asp	Leu	Val 80	
Ser Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys	
Ser Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu	
Val Trṛ	Gly 115		Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys	
Gln Thr		Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Ala	

Ala Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Glu Gly Asp Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser <210> 65

<211> 1056 <212> DNA

<213> Tomato golden mosaic virus

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		tcc aaa gaa gaa Ser Lys Glu Glu 25		96
		aac aaa aaa ttc Asn Lys Lys Phe		.44
aga gag ctt cat Arg Glu Leu His 50	gaa gat ggg caa Glu Asp Gly Gln 55	cct cac ctc cac Pro His Leu His 60	gtg ctt att cag 1 Val Leu Ile Gln	.92
		aat caa cga ttc Asn Gln Arg Phe 75		240
Ser Pro Thr Arg		cat cca aac att His Pro Asn Ile 90		88
		atc gac aaa gac Ile Asp Lys Asp 105		336
		ggt cga agt gct Gly Arg Ser Ala		884
		gag gcg tta aat Glu Ala Leu Asn 140		132
gaa gaa gcc ctg Glu Glu Ala Leu 145	cag ata att gcg Gln Ile Ile Ala 150	gcc gca atc cca Ala Ala Ile Pro 155	gaa aaa tat tta 4 Glu Lys Tyr Leu 160	180
Phe Gln Phe His		aat tta gat agg Asn Leu Asp Arg 170		528
		ttc cac gtc tca Phe His Val Ser 185		576

gtg cca gac g Val Pro Asp (195			_			624
tcc gct gcg o Ser Ala Ala A 210				e Ile Glu		672
agt cgg acg g Ser Arg Thr (225		Met Trp Ala				720
tat ttg agc o						768
gtt gag tat a Val Glu Tyr A			Thr Pro Gla			816
aaa cat tgg a Lys His Trp I 275						864
tgt aaa tac g Cys Lys Tyr (290				y Ile Pro		912
gtg ctg tgc a Val Leu Cys A 305		Glu Gly Ala				960
aaa gag gaa a Lys Glu Glu A						1008
ttc gtc ttc c Phe Val Phe I			Gln Ser Ser			1056
<210> 66 <211> 352 <212> PRT <213> Tomato	o golden mo	saic virus				
<400> 66						
Met Pro Ser I 1	His Pro Lys 5	Arg Phe Gln	Ile Asn Ala	a Lys Asn	Tyr Phe 15	

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys

Arg	Glu	Leu	His	Glu	Asp	Gly	Gln	Pro	His	Leu	His	Val	Leu	Ile	Gln	
	50					55					60					

Arg	Glu 50	Leu	His	Glu	Asp	Gly 55	Gln	Pro	His	Leu	His 60	Val	Leu	Ile	Gln
Phe 65	Glu	Gly	Lys	Туr	Cys 70	Cys	Gln	Asn	Gln	Arg 75	Phe	Phe	Asp	Leu	Val 80

- Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys
- Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu
- Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys
- Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys
- Glu Glu Ala Leu Gln Ile Ile Ala Ala Ile Pro Glu Lys Tyr Leu
- Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys
- Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn
- Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser
- Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Glu Gly Asp
- Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn
- Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys
- Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu

275	Lys Glu	Leu Ile	Gly Ala 280	Gln Arg	Asp Trp 285	Gln	Thr	Asn	
Cys Lys Tyr 290	Gly Lys	Pro Val 295		Lys Gly	Gly Ile 300	Pro	Ser	Ile	
Val Leu Cys 305	Asn Pro	Gly Glu 310	Gly Ala	Ser Tyr 315	Lys Val	Phe	Leu	Asp 320	
Lys Glu Glu	Asn Thr 325		Lys Asn	Trp Thr 330	Phe His	Asn	Ala 335	Lys	
Phe Val Phe	Leu Asn 340	Ser Pro	Leu Tyr 345		Ser Thr	Gln 350	Ser	Ser	
<210> 67 <211> 1056									
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222									
<220> <221> CDS									
-000- /11	/10EC\								
<222> (1). <223> TGMV		159 (Ala	17) mutan	t					
<223> TGMV <400> 67	AL1 EKY				CCC 222	aat	tat	+++	10
<223> TGMV	AL1 EKY	aaa cgg	rttt caa	ata aat					48
<223> TGMV <400> 67 atg cca tcg Met Pro Ser	cat cca His Pro 5	aaa cgg Lys Arg	ttt caa Phe Gln	ata aat Ile Asn 10	Ala Lys	Asn	Tyr 15 tct	Phe caa	48 96
<223> TGMV <400> 67 atg cca tcg Met Pro Ser 1 ctt aca tat	cat cca His Pro 5 cct cag Pro Gln 20	aaa cgg Lys Arg tgc tcc Cys Ser	ttt caa Phe Gln ttg tcc Leu Ser 25	ata aat Ile Asn 10 aaa gaa Lys Glu aaa aaa	Ala Lys gaa tca Glu Ser ttc ata	Asn ctt Leu 30	Tyr 15 tct Ser	Phe caa Gln tgc	
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					_	acg Thr			_		_		_			:	336
						gtc Val										:	384
						gca Ala 135										•	432
						att Ile											480
						aat Asn										!	528
						cct Pro											576
Val	Pro	Asp 195	Glu	Met	Arg	caa Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser	1	624
						aga Arg 215										•	672
Ser 225	Arg	Thr	Gly	Lys	Thr 230	atg Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240	,	720
Tyr	Leu	Ser	Gly	His 245	Leu	gat Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys	,	768
						gat Asp										;	816
						att Ile										:	864
						gtt Val 295										:	912
						gag Glu										:	960

aaa gag gaa aac act cca cta aag aac tgg act ttc cat aat gcg aaa 1008 Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys ttc gtc ttc ctc aac tcc ccc ctc tat caa agc tca aca cag agc agc 1056 Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 345 <210> 68 <211> 352 <212> PRT <213> Tomato golden mosaic virus <400> 68 Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 70 Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125 Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140 Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Ala Ala Ala Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys

16	55	170	175

Thr	Pro	Glu	Pro	Trp	Leu	Pro	Pro	Phe	His	Val	Ser	Ser	Phe	Thr	Asn
			180					185					190		

- Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205
- Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220
- Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240
- Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255
- Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270
- Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285
- Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300
- Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315
- Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335
- Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350
- <210> 69
- <211> 1056
- <212> DNA
- <213> Tomato golden mosaic virus
- <220>
- <221> CDS
- <222> (1)..(1056)
- <223> TGMV AL1 Q-HN165 (Ala8) mutant

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ctt aca tat Leu Thr Tyr								96
tta caa gcc Leu Gln Ala 35								144
aga gag ctt Arg Glu Leu 50								192
ttc gag gga Phe Glu Gly 65				_		_		240
tcc cca aca Ser Pro Thr						Arg A		288
tcg tct tcc Ser Ser Ser								336
gta tgg gga Val Trp Gly 115	Glu Phe	cag gtc Gln Val	gac ggt Asp Gly 120	cga agt Arg Ser	gct aga Ala Arg 125	gga g Gly G	ggt tgc Gly Cys	384
caa aca tct Gln Thr Ser 130								432
gaa gaa gcc Glu Glu Ala 145								480
ttt gcg ttc Phe Ala Phe	gcc gct Ala Ala 165	cta aat Leu Asn	agc aat Ser Asn	tta gat Leu Asp 170	agg ata Arg Ile	Phe A	gat aag Asp Lys 175	528
act cct gaa Thr Pro Glu								576
gtg cca gac Val Pro Asp 195	Glu Met							624
tcc gct gcg Ser Ala Ala 210								672

			cta ggc cca cat Leu Gly Pro His	
			gtt tac tca aac Val Tyr Ser Asn 255	
			caa tat cta aag Gln Tyr Leu Lys 270	
			gat tgg cag act Asp Trp Gln Thr 285	
			ggt atc ccg tca Gly Ile Pro Ser 300	
			aaa gtt ttc ctc Lys Val Phe Leu	
		_	ttc cat aat gcg Phe His Asn Ala 335	
			tca aca cag agc Ser Thr Gln Ser 350	
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<400> 70				
Met Pro Ser His 1	Pro Lys Arg 5	Phe Gln Ile Asr 10	ı Ala Lys Asn Tyr 15	Phe
Leu Thr Tyr Pro 20	Gln Cys Ser	Leu Ser Lys Glu 25	Glu Ser Leu Ser 30	Gln
Leu Gln Ala Leu 35	Asn Thr Pro	Ile Asn Lys Lys	Phe Ile Lys Ile 45	Cys
Arg Glu Leu His 50	Glu Asp Gly 55	Gln Pro His Leu	His Val Leu Ile 60	Gln

65	GIU	GIÀ	гÀг	Tyr	70	Cys	GIN	Asn	Gin	75	Pne	Pue	Asp	ьeu	80
Ser	Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Ala	Phe	Ala	Ala 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys	Tyr	Gly	Lys	Pro	Val	Gln	Ile	Lys	Gly	Gly	Ile	Pro	Ser	Ile

290	295	300

Val Leu Cys Asn 305	Pro Gly Glu Gly 310	y Ala Ser Tyr Lys 315	Val Phe Leu Asp 320
Lys Glu Glu Asn	Thr Pro Leu Lys	s Asn Trp Thr Phe 330	His Asn Ala Lys 335
Phe Val Phe Leu 340	Asn Ser Pro Le	u Tyr Gln Ser Ser 345	Thr Gln Ser Ser 350
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		g tcc aaa gaa gaa u Ser Lys Glu Glu 25	
		t aac aaa aaa ttc e Asn Lys Lys Phe	
		a cct cac ctc cac n Pro His Leu His 60	
		a aat caa cga ttc n Asn Gln Arg Phe 75	
		c cat cca aac att e His Pro Asn Ile 90	
		c atc gac aaa gac r Ile Asp Lys Asp 105	
gta tgg gga gaa Val Trp Gly Glu	ttc cag gtc gad Phe Gln Val As	c ggt cga agt gct o Gly Arg Ser Ala	aga gga ggt tgc 384 Arg Gly Gly Cys

115	120	125

								gag Glu								4	132
								gag Glu								4	180
								gcg Ala								5	528
								ttc Phe 185								5	576
								gct Ala								6	24
								att Ile								6	572
								gct Ala								7	720
								aat Asn								7	768
								gtc Val 265								8	316
		${\tt Trp}$	Lys	Glu		Ile	Gly	gcc Ala								8	364
								att Ile								9	912
gtg Val 305	ctg Leu	tgc Cys	aat Asn	cct Pro	gga Gly 310	gag Glu	ggt Gly	gct Ala	agc Ser	tat Tyr 315	aaa Lys	gtt Val	ttc Phe	ctc Leu	gac Asp 320	9	960
								aac Asn								10	800
								tat Tyr 345								10	56

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<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 72

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Ala Leu Ala Ala Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

vai		195	GIU	Mec	Arg	GIII	200	AIG	Giu	ASII	lyr	205	GIY	пуѕ	ser	
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp	
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240	
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys	
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu	
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	
Val 305		Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys	
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser	
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ctt	aca	tat	cct	cag	tgc	tcc	ttg	tcc	aaa	gaa	gaa	tca	ctt	tct	caa	96

Leu	Thr	Tyr	Pro 20	Gln	Cys	Ser	Leu	Ser 25	Lys	Glu	Glu	Ser	Leu 30	Ser	Gln	
		_				_					ttc Phe				_	144
				_	_						cac His 60				_	192
					-	_				_	ttc Phe		_	_	_	240
											att Ile					288
											gac Asp					336
											gct Ala					384
						_	_		-		aat Asn 140	_				432
							_				cca Pro	-				480
											agg Arg					528
											tca Ser					576
											tat Tyr					624
											atc Ile 220					672
											cta Leu					720
											gtt Val					768

24	5	250	255
		aca ccg caa tat cta Thr Pro Gln Tyr Leu 270	Lys Leu
		caa aga gat tgg cag Gln Arg Asp Trp Gln 285	
		aaa gga ggt atc ccg Lys Gly Gly Ile Pro 300	
		agc tat aaa gtt tto Ser Tyr Lys Val Phe 315	
	r Pro Leu Lys Asn	tgg act ttc cat aat Trp Thr Phe His Asn 330	
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Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln Thr 130		Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu Glu 145	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Ala
Thr Pro	Ala	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser Ala 210		Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser Arg 225	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr Leu	. Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys Lys 290		Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val Leu 305	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320

325 330 Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 345 <210> 75 <211> 1056 <212> DNA <213> Tomato golden mosaic virus <220> <221> CDS <222> (1)..(1056) <223> TGMV AL1 AAA136 (Leu) mutant <400> 75 atg cca tcg cat cca aaa cgg ttt caa ata aat gcc aaa aat tat ttt 48 Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe ctt aca tat cct cag tgc tcc ttg tcc aaa gaa gaa tca ctt tct caa 96 Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln tta caa gcc cta aac act ccg att aac aaa aaa ttc ata aaa atc tgc 144 Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 40 aga gag ctt cat gaa gat ggg caa cct cac ctc cac gtg ctt att cag 192 Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 ttc gag gga aaa tac tgc tgc caa aat caa cga ttc ttc gac ctg gta 240 Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 70 tcc cca aca agg tca gca cat ttc cat cca aac att caq aga qct aaa 288 Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 tcg tct tcc gac gtc aag acg tac atc gac aaa gac gga gat act ctt 336 Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 gta tgg gga gaa ttc cag gtc gac ggt cga agt gct aga gga ggt tgc 384 Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys caa aca tot aac gac ott ota ota gag goo tta aat got tot too aaa 432 Gln Thr Ser Asn Asp Leu Leu Leu Glu Ala Leu Asn Ala Ser Ser Lys 135

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys

480

gaa gaa gcc ctg cag ata att aga gag aaa atc cca qaa aaa tat tta

Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160	
											agg Arg					528
							_			_	tca Ser					576
								-	_		tat Tyr			_	_	624
						_			-		atc Ile 220				_	672
											cta Leu					720
											gtt Val					768
											caa Gln					816
aaa Lys	cat His	tgg Trp 275	aaa Lys	gaa Glu	ctc Leu	att Ile	999 Gly 280	gcc Ala	caa Gln	aga Arg	gat Asp	tgg Trp 285	cag Gln	act Thr	aac Asn	864
											ggt Gly 300					912
gtg Val 305	ctg Leu	tgc Cys	aat Asn	cct Pro	gga Gly 310	gag Glu	ggt Gly	gct Ala	agc Ser	tat Tyr 315	aaa Lys	gtt Val	ttc Phe	ctc Leu	gac Asp 320	960
											ttc Phe					1008
											tca Ser					1056

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<211> 352

<212> PRT

<213> Tomato golden mosaic virus

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

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20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Leu Leu Leu Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Glu Gly Asp 210 215 220

Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240	
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys	
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu	
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	•
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	
Val 305	Leu	Суз	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys	
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser	
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					tgc Cys											96
					act Thr											144

	gag Glu 50															192
	gag Glu															240
	cca Pro															288
	tct Ser															336
	tgg Trp															384
caa Gln	aca Thr 130	tct Ser	aac Asn	gac Asp	gct Ala	gca Ala 135	gcg Ala	gcc Ala	gcg Ala	tta Leu	gct Ala 140	gct Ala	tct Ser	tcc Ser	gcg Ala	432
	gca Ala															480
	cag Gln															528
	cct Pro															576
	cca Pro															624
	gct Ala 210															672
	cgg Arg															720
	ttg Leu															768
	gag Glu															816
aaa	cat	tgg	aaa	gaa	ctc	att	aaa	gcc	caa	aga	gat	tgg	cag	act	aac	864

Lys His Trp Lys 275	Glu Leu Ile	Gly Ala Gln 2 280	Arg Asp Trp Gln 285	Thr Asn
			gga ggt atc ccg Gly Gly Ile Pro 300	
		Gly Ala Ser	tat aaa gtt ttc Tyr Lys Val Phe 315	
			act ttc cat aat Thr Phe His Asn	
	Asn Ser Pro		agc tca aca cag Ser Ser Thr Gln 350	
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Leu Gln Ala Leu 35	Asn Thr Pro	Ile Asn Lys 1	Lys Phe Ile Lys 45	Ile Cys
Arg Glu Leu His	Glu Asp Gly 55	Gln Pro His	Leu His Val Leu 60	Ile Gln
Phe Glu Gly Lys	Tyr Cys Cys 70		Arg Phe Phe Asp 75	Leu Val 80
Ser Pro Thr Arg	Ser Ala His 85	Phe His Pro 2	Asn Ile Gln Arg	Ala Lys 95
Ser Ser Ser Asp		Tyr Ile Asp 1	Lys Asp Gly Asp 110	Thr Leu
Val Trp Gly Glu	Phe Gln Val	Asp Gly Arg	Ser Ala Arg Gly 125	Gly Cys

Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Ala	Ala	Leu	Ala 140	Ala	Ser	Ser	Ala
Ala 145	Ala	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser

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ctt aca tat cct Leu Thr Tyr Pro 20				
tta caa gcc cta Leu Gln Ala Leu 35	Asn Thr Pro I			
aga gag ctt cat Arg Glu Leu His 50				
ttc gag gga aaa Phe Glu Gly Lys 65				
tcc cca aca agg Ser Pro Thr Arg			n Ile Gln Arg	
tcg tct tcc gac Ser Ser Ser Asp 100	Val Lys Thr T			
gta tgg gga gaa Val Trp Gly Glu 115	Phe Gln Val A			
caa aca tct aac Gln Thr Ser Asn 130				
gaa gaa gcc ctg Glu Glu Ala Leu 145			e Pro Glu Lys	
ttt cag ttc cac Phe Gln Phe His			p Arg Ile Phe	

						cct Pro										576
						caa Gln										624
						aga Arg 215										672
agt Ser 225	cgg Arg	acg Thr	gga Gly	aag Lys	act Thr 230	atg Met	tgg Trp	gct Ala	cgt Arg	tca Ser 235	cta Leu	ggc Gly	cca Pro	cat His	aat Asn 240	720
						gat Asp										768
						gat Asp										816
						att Ile										864
						gtt Val 295										912
gtg Val 305	ctg Leu	tgc Cys	aat Asn	cct Pro	gga Gly 310	gag Glu	ggt Gly	gct Ala	agc Ser	tat Tyr 315	aaa Lys	gtt Val	ttc Phe	ctc Leu	gac Asp 320	960
						cta Leu										1008
						ccc Pro										1056
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<211> 352

<212> PRT

<213> Tomato golden mosaic virus

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Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln

Leu	Asn	Thr	Pro	Ile	Asn	Lvs	Lvs	Phe	Ile	Lvs	Ile	Cvs

30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

25

20

- Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60
- Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80
- Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95
- Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110
- Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125
- Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Ala 130 135 140
- Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160
- Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175
- Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190
- Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205
- Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Glu Gly Asp 210 215 220
- Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240
- Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

vai	GIU	TYT	260	Vai	116	Asp	Asp	265	1111	PIO	GIII	TYL	270	цуъ	Leu	
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys	
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser	
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	cca										gcc Ala					48
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											ttc Phe					144
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											ttc Phe					240

		gca Ala						288
		aag Lys						336
		cag Gln						384
		gct Ala						432
		ata Ile 150						480
		cta Leu						528
		ctt Leu						576
		aga Arg						624
		gag Glu						672
		act Thr 230						720
		ttg Leu						768
		atc Ile						816
		ctc Leu						864
		cca Pro						912

gtg ctg tgc aat cct gga gag ggt gct agc tat aaa gtt ttc ctc Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu 305 310 315	
aaa gag gaa aac act cca cta aag aac tgg act ttc cat aat gcg Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala 325 330 335	
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Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile 35 40 45	Cys
Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile 50 55 60	Gln
Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu 65 70 75	Val 80
Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala 85 90 95	Lys
Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr 100 105 110	Leu
Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly 115 120 125	Cys
Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser 130 135 140	Lys

Ala Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu

145 150	155	160
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Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys
165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240

Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335

Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350

<210> 83

<211> 1056

<212> DNA

<213> Tomato golden mosaic virus

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		gcg Ala											672	2
		acg Thr											720)
		agc Ser											768	3
		tat Tyr											816	5
		tgg Trp 275											864	1
		tac Tyr											912	3
		tgc Cys											960)
		gaa Glu											1008	3
		ttc Phe											1056	5
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	_	_	•	_	_	_	_ •			_				

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg	Glu 50	Leu	His	Glu	Asp	Gly 55	Gln	Pro	His	Leu	His 60	Val	Leu	Ile	Gln
Phe 65	Glu	Gly	Lys	Tyr	Cys 70	Cys	Gln	Asn	Gln	Arg 75	Phe	Phe	Asp	Leu	Val 80
Ser	Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Ala	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235		Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp	Lys	Glu	Leu	Ile	Gly	Ala	Gln	Arg	Asp	Trp	Gln	Thr	Asn

275 280 285

Cys Lys Tyr Gly 290	Lys Pro Val 295	Gln Ile Lys Gly	Gly Ile Pro Ser 300	Ile
Val Leu Cys Asn 305	n Pro Gly Glu 310	Gly Ala Ser Tyr 315	Lys Val Phe Leu	Asp 320
Lys Glu Glu Asn	Thr Pro Leu 325	Lys Asn Trp Thr 330	Phe His Asn Ala 335	Lys
Phe Val Phe Leu 340		Leu Tyr Gln Ser 345	Ser Thr Gln Ser 350	Ser
<210> 85 <211> 1056 <212> DNA <213> Tomato g	golden mosaic	virus		
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ctt aca tat cct Leu Thr Tyr Pro 20	cag tgc tcc Gln Cys Ser	ttg tcc aaa gaa Leu Ser Lys Glu 25	gaa tca ctt tct Glu Ser Leu Ser 30	caa 96 Gln
	Asn Thr Pro		ttc ata aaa atc Phe Ile Lys Ile 45	
			cac gtg ctt att His Val Leu Ile 60	
			ttc ttc gac ctg Phe Phe Asp Leu	
			att cag aga gct Ile Gln Arg Ala 95	
			gac gga gat act Asp Gly Asp Thr	

100	105	110

	tgg Trp															384
	aca Thr 130															432
	gcc Ala															480
	cag Gln															528
	cct Pro															576
	cca Pro															624
	gct Ala 210															672
	cgg Arg															720
	ttg Leu															768
	gag Glu			Val	Ile	Asp		Val	Thr					Lys		816
	cat His															864
	aaa Lys 290															912
	ctg Leu															960
aaa Lys	gag Glu	gaa Glu	aac Asn	act Thr 325	cca Pro	cta Leu	aag Lys	aac Asn	tgg Trp 330	act Thr	ttc Phe	cat His	aat Asn	gcg Ala 335	aaa Lys	1008

ttc gtc ttc ctc aac tcc ccc ctc tat caa agc tca aca cag agc agc
Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser
340 345 350

<210> 86 <211> 352 <212> PRT <213> Tomato golden mosaic virus

<400> 86

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Ala Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175 Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240

Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335

Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350

<210> 87

<211> 1056

<212> DNA

<213> Tomato golden mosaic virus

<220>

<221> CDS

<222> (1)..(1056)

<223> TGMV AL1 A147Y mutant

<400> 87

atg cca tcg cat cca aaa cgg ttt caa ata aat gcc aaa aat tat ttt 48

Met 1	Pro	Ser	His	Pro 5	Lys	Arg	Phe	Gln	Ile 10	Asn	Ala	Lys	Asn	Tyr 15	Phe	
								tcc Ser 25								96
								aac Asn								144
								cct Pro								192
								aat Asn								240
								cat His								288
								atc Ile 105								336
gta Val	tgg Trp	gga Gly 115	gaa Glu	ttc Phe	cag Gln	gtc Val	gac Asp 120	ggt Gly	cga Arg	agt Ser	gct Ala	aga Arg 125	gga Gly	ggt Gly	tgc Cys	384
caa Gln	aca Thr 130	tct Ser	aac Asn	gac Asp	gct Ala	gca Ala 135	gca Ala	gag Glu	gcg Ala	tta Leu	aat Asn 140	gct Ala	tct Ser	tcc Ser	aaa Lys	432
gaa Glu 145	gaa Glu	tac Tyr	ctt Leu	cag Gln	ata Ile 150	att Ile	aga Arg	gag Glu	aaa Lys	atc Ile 155	cca Pro	gaa Glu	aaa Lys	tat Tyr	tta Leu 160	480
								aat Asn								528
								ttc Phe 185								576
gtg Val	cca Pro	gac Asp 195	gag Glu	atg Met	aga Arg	caa Gln	tgg Trp 200	gct Ala	gaa Glu	aat Asn	tat Tyr	ttt Phe 205	gga Gly	aag Lys	agt Ser	624
tcc Ser	gct Ala 210	gcg Ala	cgg Arg	ccg Pro	gag Glu	aga Arg 215	cct Pro	att Ile	agt Ser	att Ile	atc Ile 220	atc Ile	gag Glu	ggc Gly	gat Asp	672
								gct Ala								720

225	230	235	240
	ttg gat ctc aat tct Leu Asp Leu Asn Ser 250		n Lys
	atc gat gat gtc aca Ile Asp Asp Val Thr 265		
_	ctc att ggg gcc caa Leu Ile Gly Ala Gln 280		
	cca gtt caa att aaa Pro Val Gln Ile Lys 295		
	gga gag ggt gct agc Gly Glu Gly Ala Ser 310		
	cca cta aag aac tgg Pro Leu Lys Asn Trp 330		a Lys
	tcc ccc ctc tat caa Ser Pro Leu Tyr Gln 345		
<210> 88 <211> 352 <212> PRT <213> Tomato golde	n mosaic virus		
<400> 88			
Met Pro Ser His Pro 1 5	Lys Arg Phe Gln Ile	Asn Ala Lys Asn Ty 15	r Phe
1 5		15	
Leu Thr Tyr Pro Gln	10 Cys Ser Leu Ser Lys	Glu Glu Ser Leu Se 30	r Gln
Leu Thr Tyr Pro Gln 20 Leu Gln Ala Leu Asn 35	Cys Ser Leu Ser Lys 25 Thr Pro Ile Asn Lys	Glu Glu Ser Leu Se 30 Lys Phe Ile Lys Il 45	r Gln e Cys

ser	Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Tyr	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320	
Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335	
Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350	
<210> 89 <211> 1056 <212> DNA <213> Tomato golden mosaic virus	
<220> <221> CDS <222> (1)(1056) <223> TGMV AL1 L148 mutant	
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ctt aca tat cct cag tgc tcc ttg tcc aaa gaa gaa tca ctt tct caa Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30	96
tta caa gcc cta aac act ccg att aac aaa aaa ttc ata aaa atc tgc Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45	144
aga gag ctt cat gaa gat ggg caa cct cac ctc cac gtg ctt att cag Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60	192
ttc gag gga aaa tac tgc tgc caa aat caa cga ttc ttc gac ctg gta Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80	240
tcc cca aca agg tca gca cat ttc cat cca aac att cag aga gct aaa Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95	288
tcg tct tcc gac gtc aag acg tac atc gac aaa gac gga gat act ctt Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110	336
gta tgg gga gaa ttc cag gtc gac ggt cga agt gct aga gga ggt tgc Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125	384
caa aca tet aac gae get gea gea gag geg tta aat get tet tee aaa	432

Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys	
					ata Ile 150											480
					cta Leu											528
					ctt Leu											576
					aga Arg											624
					gag Glu											672
					act Thr 230											720
					ttg Leu											768
					atc Ile											816
					ctc Leu											864
					cca Pro											912
					gga Gly 310											960
					cca Pro											1008
					tcc Ser											1056

<210> 90

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 90

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln
20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Ala Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp	
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240	
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys	
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu	
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys	
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser	
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											gaa Glu					96

						ccg Pro										144
						22 23 393										192
						tgc Cys										240
						cat His										288
						acg Thr										336
						gtc Val										384
						gca Ala 135										432
Glu 145	Glu	Ala	Val	Gln	Ile 150	att Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160	480
						aat Asn										528
						cct Pro										576
Val	Pro	Asp 195	Glu	Met	Arg	caa Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser	624
						aga Arg 215										672
						atg Met										720
						gat Asp										768
gtt	gag	tat	aac	gtc	atc	gat	gat	gtc	aca	ccg	caa	tat	cta	aag	ttg	816

:	Asn Val 260	Ile Asp	Asp Val		o Gln T	Tyr Leu 270	Lys I	Leu
aaa cat tgg Lys His Trp 275					g Asp T			
tgt aaa tac g Cys Lys Tyr (290								
gtg ctg tgc Val Leu Cys 305					r Lys V		Leu A	
aaa gag gaa Lys Glu Glu			_					
ttc gtc ttc Phe Val Phe				Gln Se				
<210> 92 <211> 352 <212> PRT <213> Tomate	o golder	n mosaic	virus					
<400> 92								
Met Pro Ser	His Pro 5	Lys Arg	Phe Glr	ille As 10	sn Ala I	Lys Asn	Tyr 1	Phe
Met Pro Ser	5			10		-	15	
Met Pro Ser	5 Pro Gln 20	Cys Ser	Leu Sei 25	10 Lys Gl	lu Glu S /s Phe I	Ser Leu 30	15 Ser (Gln
Met Pro Ser	5 Pro Gln 20 Leu Asn	Cys Ser Thr Pro	Leu Ser 25 Ile Asr 40	10 Lys Gl	lu Glu s /s Phe I	Ser Leu 30 Ile Lys 45	Ser (Gln Cys
Met Pro Ser : Leu Thr Tyr Leu Gln Ala : 35	5 Pro Gln 20 Leu Asn His Glu	Cys Ser Thr Pro Asp Gly 55	Leu Ser 25 Ile Asr 40 Gln Pro	10 Lys Gl	ou Glu Son Phe In Go	Ser Leu 30 Ile Lys 45 Val Leu	Ser (Gln Cys Gln
Met Pro Ser 1 Leu Thr Tyr Leu Gln Ala 35 Arg Glu Leu 50 Phe Glu Gly	Pro Gln 20 Leu Asn His Glu Lys Tyr	Cys Ser Thr Pro Asp Gly 55 Cys Cys 70	Leu Ser 25 Ile Asr 40 Gln Pro	Lys Gl Lys Ly His Le	ou Glu Son Phe 16 60 cg Phe 16 66	Ser Leu 30 Ile Lys 45 Val Leu Phe Asp	Ser (Gln Cys Gln Val 80

Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Val	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val 305	Leu	Суз	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys

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Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser

345

340

155

480

160

gaa gaa gcc gtt cag ata att aga gag aaa atc cca qaa aaa tat tta

Glu Glu Ala Val Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu

145

cag Gln								528
cct Pro								576
cca Pro								624
gct Ala 210								672
cgg Arg								720
ttg Leu								768
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cat His								864
aaa Lys 290								912
ctg Leu								960
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<212> PRT

<213> Tomato golden mosaic virus

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Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Val Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240

Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys	
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu	
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys	
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser	
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					tgc Cys 70											240
					gca Ala											288
					aag Lys											336
					cag Gln											384
					gct Ala											432
					ata Ile 150											480
					cta Leu											528
Thr	Pro	Glu	Pro 180	Trp	ctt Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn	576
					aga Arg											624
					gag Glu											672
Ser 225	Arg	Thr	Gly	Lys	act Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240	720
					ttg Leu											768
					atc Ile											816
					ctc Leu			_		_	_		_			864

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Leu	Gln	Ala 35	Leu	Asn	Thr	Pro	Ile 40	Asn	Lys	Lys	Phe	Ile 45	Lys	Ile	Cys	
Arg	Glu 50	Leu	His	Glu	Asp	Gly 55	Gln	Pro	His	Leu	His 60	Val	Leu	Ile	Gln	
Phe 65	Glu	Gly	Lys	Tyr	Cys 70	Cys	Gln	Asn	Gln	Arg 75	Phe	Phe	Asp	Leu	Val 80	
Ser	Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys	
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu	
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys	

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys

130 135 140

Glu Glu Ala Gly Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240

Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335

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185

180

		gac Asp 195								624
	_	gcg Ala	 _	 _		_			 _	672
		acg Thr								720
		agc Ser								768
		tat Tyr								816
		tgg Trp 275								864
_		tac Tyr	 _	_			 	_		912
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Leu Gln Ala 35	Leu Asn	Thr Pro	Ile Ass	n Lys Ly:		le Lys 5	Ile	Cys
Arg Glu Leu 50	His Glu	Asp Gly 55	Gln Pro	o His Le	ı His V 60	al Leu	Ile	Gln
Phe Glu Gly 65	Lys Tyr	Cys Cys 70	Gln As	n Gln Arg 75	g Phe P	he Asp	Leu	Val 80
Ser Pro Thr	Arg Ser 85	Ala His	Phe Hi	s Pro Ası 90	n Ile G	ln Arg	Ala 95	Lys
Ser Ser Ser	Asp Val	Lys Thr	Tyr Il		s Asp G	ly Asp 110	Thr	Leu
Val Trp Gly		Gln Val	Asp Gl	y Arg Se:		rg Gly 25	Gly	Cys
Gln Thr Ser 130	Asn Asp	Ala Ala 135		u Ala Le	ı Asn A 140	la Ser	Ser	Lys
Glu Glu Ala 145	. Leu Gln	Ala Ala 150	Arg Gl	u Lys Ile 15!		lu Lys	Tyr	Leu 160
Phe Gln Phe	His Asn 165		Ser As	n Leu Ası 170	o Arg I	le Phe	Asp 175	Lys
Thr Pro Glu	Pro Trp	Leu Pro	Pro Ph 18		l Ser S	er Phe 190	Thr	Asn
Val Pro Asp 195		Arg Gln	Trp Al 200	a Glu Ası	_	he Gly 05	Lys	Ser
Ser Ala Ala 210	Arg Pro	Glu Arg 215		e Ser Ile	e Ile I 220	le Glu	Gly	Asp
Ser Arg Thr 225	Gly Lys	Thr Met 230	Trp Al	a Arg Se: 23!		ly Pro	His	Asn 240
Tyr Leu Ser	Gly His 245	Leu Asp	Leu As	n Ser Arç 250	g Val T	'yr Ser	Asn 255	Lys
Val Glu Tyr	Asn Val	Ile Asp	Asp Va	l Thr Pro	o Gln T	yr Leu	Lys	Leu

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320

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Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350

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Leu	Thr	Tyr	Pro	Gln	Cys	Asp	Ile	Pro	Lys	Asp	Glu	Ala	Leu	Gln	Met		
			20					25					30				
Leu	Gln	Thr	Leu	Ser	\mathtt{Trp}	Ser		Val	Lys	Pro	Thr	_	Ile	Arg	Val		
		35					40					45					
Ala	Arg	Glu	Glu	His	Ser	Asp	${\tt Gly}$	Phe	Pro	His	Leu	His	Cys	Leu	Ile		
	50					55					60						
Gln	Leu	Ser	Gly	Lys	Ser	Asn	Ile	Lys	Asp	Ala	Arq	Phe	Phe	Asp	Ile		
65			-	-	70			-	-	75	_			-	80		

Thr His Pro Arg Arg Ser Ala Asn Phe His Pro Asn Ile Gln Ala Ala

Lys Asp Thr Asn Ala Val Lys Asn Tyr Ile Thr Lys Asp Gly Asp Tyr Cys Glu Ser Gly Gln Tyr Lys Val Ser Gly Gly Thr Lys Ala Asn Lys Asp Asp Val Tyr His Asn Ala Val Asn Ala Gly Cys Val Glu Glu Ala Leu Ala Ile Ile Arg Ala Gly Asp Pro Lys Thr Phe Ile Val Ser Tyr His Asn Val Arg Ala Asn Ile Glu Arg Leu Phe Thr Lys Ala Pro Glu Pro Trp Ala Pro Pro Phe Gln Leu Ser Ser Phe Thr Asn Val Pro Asp Glu Met Ser Ser Trp Ala Asp Asp Tyr Phe Gly Arg Ser Ala Ala Ala Arg Ala Glu Arg Pro Ile Ser Ile Ile Val Glu Gly Asp Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ala Leu Gly Pro His Asn Tyr Leu Ser Gly His Leu Asp Phe Asn Ser Lys Val Phe Ser Asn Asn Ala Glu Tyr Asn Val Ile Asp Asp Ile Ala Pro His Tyr Leu Lys Leu Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Ser Asn Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile Val Leu Cys Asn Pro Gly Glu Gly Ser Ser Tyr Ile Ser Phe Leu Asn Lys Glu Glu

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Leu Glu Ala Pro Leu Tyr Gln Ser Thr Ala Gln Asp Cys 340 345

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Glu Ala Leu Ala Ile Ile Arg Ala Gly Asp Pro Lys Thr Phe Ile Val

Ser Tyr His Asn Val Arg Ala Asn Ile Glu Arg Leu Phe Thr Lys Ala 50 55 60

Pro Glu Pro Trp Ala Pro 65 70

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<222> (35)..(35)

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Asp Tyr Cys Glu Ser Gly Gln Tyr Lys Val Ser Gly Gly Thr Lys Ala

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Glu Ala Ala Ile Ile Arg Ala Gly Asp Pro Lys Thr Phe Ile Val 35 40 45

Ser Tyr His Asn Val Arg Ala Asn Ile Glu Arg Leu Phe Thr Lys Ala 50 55 60

Pro Glu Pro Trp Ala Pro 65 70

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gacatagete egeattatet aaagetaaag eactggaaag agettattgg ggeecaaagg	840
gactggcaat caaactgtaa gtacggcaag ccagttcaaa ttaaaggtgg cataccctca	900
atcgtgctgt gcaatccagg agaggggagc agttatataa gtttcctcaa caaagaggaa	960
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ctt caa acc ctg tcg tgg tca gtc gtc aaa ccc aca tac atc aga gtc Leu Gln Thr Leu Ser Trp Ser Val Val Lys Pro Thr Tyr Ile Arg Val 35 40 45	144
gca aga gag gaa cat tca gac ggg ttc ccc cat tta cac tgt ctc atc Ala Arg Glu Glu His Ser Asp Gly Phe Pro His Leu His Cys Leu Ile 50 55 60	192
caa cta tca gga aag tcg aac atc aag gat gct aga ttt ttc gac atc Gln Leu Ser Gly Lys Ser Asn Ile Lys Asp Ala Arg Phe Phe Asp Ile 65 70 75 80	240
act cac ccc aga agg tct gcc aat ttt cac cca aac att cag gca gcc Thr His Pro Arg Arg Ser Ala Asn Phe His Pro Asn Ile Gln Ala Ala 85 90 95	288
aaa gac acc aat gcc gtc aag aat tac atc acc aaa gat ggt gat tat Lys Asp Thr Asn Ala Val Lys Asn Tyr Ile Thr Lys Asp Gly Asp Tyr 100 105 110	336
tgt gaa tcc ggg cag tac aag gtg tct ggg ggt aca aag gca aat aaa Cys Glu Ser Gly Gln Tyr Lys Val Ser Gly Gly Thr Lys Ala Asn Lys 115 120 125	384
gac gac gtc tac cac aac gcc gtc aat gcg gga tgt gtg gaa gag gcg Asp Asp Val Tyr His Asn Ala Val Asn Ala Gly Cys Val Glu Glu Ala	432

130	135		140	•
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			t act aac gtc ccg e Thr Asn Val Pro 190	
			t cgg agt gcc gct y Arg Ser Ala Ala 205	
		Ile Ile Val Gl	a ggt gat tca cga u Gly Asp Ser Arg 220	
			ea cat aat tat ttg TO His Asn Tyr Let 15	
			ea aat aat gcg gag er Asn Asn Ala Gli 25!	ı Tyr
Asn Val Ile			a aag cta aag cad u Lys Leu Lys His 270	
			a tca aac tgt aag n Ser Asn Cys Lys 285	
		Gly Gly Ile Pr	cc tca atc gtg ctg co Ser Ile Val Let 300	
			c ctc aac aaa gag ne Leu Asn Lys Gli .5	
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Leu Gln Thr Leu Ser Trp Ser Val Val Lys Pro Thr Tyr Ile Arg Val 35 40 45

Ala Arg Glu Glu His Ser Asp Gly Phe Pro His Leu His Cys Leu Ile 50 55 60

Gln Leu Ser Gly Lys Ser Asn Ile Lys Asp Ala Arg Phe Phe Asp Ile
65 70 75 80

Thr His Pro Arg Arg Ser Ala Asn Phe His Pro Asn Ile Gln Ala Ala 85 90 95

Lys Asp Thr Asn Ala Val Lys Asn Tyr Ile Thr Lys Asp Gly Asp Tyr 100 105 110

Cys Glu Ser Gly Gln Tyr Lys Val Ser Gly Gly Thr Lys Ala Asn Lys 115 120 125

Asp Asp Val Tyr His Asn Ala Val Asn Ala Gly Cys Val Glu Glu Ala 130 135 140

Ala Ala Ile Ile Arg Ala Gly Asp Pro Lys Thr Phe Ile Val Ser Tyr 145 150 155 160

His Asn Val Arg Ala Asn Ile Glu Arg Leu Phe Thr Lys Ala Pro Glu 165 170 175

Pro Trp Ala Pro Pro Phe Gln Leu Ser Ser Phe Thr Asn Val Pro Asp 180 185 190

Glu Met Ser Ser Trp Ala Asp Asp Tyr Phe Gly Arg Ser Ala Ala Ala 195 200 205

Arg Ala Glu Arg Pro Ile Ser Ile Ile Val Glu Gly Asp Ser Arg Thr 210 215 Gly Lys Thr Met Trp Ala Arg Ala Leu Gly Pro His Asn Tyr Leu Ser 225 230 235 240 Gly His Leu Asp Phe Asn Ser Lys Val Phe Ser Asn Asn Ala Glu Tyr 245 Asn Val Ile Asp Asp Ile Ala Pro His Tyr Leu Lys Leu Lys His Trp 265 Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Ser Asn Cys Lys Tyr 280 Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile Val Leu Cys 290 295 300 Asn Pro Gly Glu Gly Ser Ser Tyr Ile Ser Phe Leu Asn Lys Glu Glu 305 310 315 320 Asn Ala Ser Leu Arg Ala Trp Thr Thr Lys Asn Ala Lys Phe Ile Thr 325 330 Leu Glu Ala Pro Leu Tyr Gln Ser Thr Ala Gln Asp Cys 340 <210> 113 <211> 13 <212> PRT <213> Artificial <220> <223> Consensus begomovirus AL1/C1 sequence <220> <221> MISC FEATURE <222> (1)..(3) Xaa can be any naturally occurring amino acid, but is generally a <223> charged amino acid which is optionally present or absent <220> <221> MISC_FEATURE <222> (5)..(5) <223> Xaa can be Leu or Met <220>

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